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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/540,629 | 06/23/2005 | Yuichi Tokita | S1459.70075US00 | 5380 |

23628 7590 10/30/2006

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| EXAMINER |
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MCDONALD, RODNEY GLENN

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| ART UNIT | PAPER NUMBER |
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1753

DATE MAILED: 10/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/540,629

Applicant(s)

TOKITA ET AL.

Examiner

Rodney G. McDonald

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to:
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 7-24-06.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application
- ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1 and 3-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uchida et al, "Application of Titania Nanotubes to a Dye-Sensitized Solar Cell," Electrochemistry, June 2002, Vol. 70, No 6, pages 418-420 in view of Wariishi et al (U.S. Patent 6,376,765) and Yoshikawa (U.S. Patent 6,586,670).

Uchida et al prepares a dye-sensitized solar cell comprising a semiconductor layer containing titania nanotubes that are sensitized with a ruthenium dye (see the Experimental section bridging pages 418 and 419). Uchida et al soaks the titania nanotubes (which are coated on a glass substrate) in an ethanol solution of ruthenium

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dye for 20 hr at room temperature to prepare the dye-sensitized titania nanotubes (see page 219). It is the Examiner's position that this inherently results in the dye being "retained" by the nanotubes. It is also the Examiner's position that the titania used by Uchida et al, i.e. the titania from Kasuga (see the second line of the Experimental section of Uchida et al), is anatase. It is also the Examiner's position that the particles of ruthenium dye do not "associate" with each other. The titania has a particle size of 30 nm (see the Experimental section). The solar cell prepared has the instant substrates (see the Experimental section). Uchida et al teaches the limitations of the instant claims, other than the difference which is discussed below.

With respect to claims 1 and 11, Uchida et al does not specifically teach that its sensitizing dye has no acidic groups. With respect to claim 3, Uchida et al does not specifically teach using at least two kinds of sensitizing dyes.

Wariishi et al teaches dyes that can be used in dye-sensitized solar cells (see col. 26, lines 56 through col. 54). Many dyes, such as dyes S-1, S-3 to S-20, S-22, S-23, S-27 to S-29, S-33, S-37 and S-41, among the dyes illustrated by Wariishi et al do not contain acidic groups (see col. 47 through col. 52). Wariishi et al also teaches that two or more dyes may be used as a mixture to obtain a large photoelectric conversion region and a high photoelectric conversion efficiency (see col. 26, lines 59-62).

Yoshikawa also teaches dyes that can be used in dye-sensitized solar cells, such as dye M-1 at col. 24, which does not contain acidic groups. Yoshikawa also teaches that two or more dyes may be used as a mixture to obtain a large photoelectric conversion region and a high photoelectric conversion efficiency (see col. 20, lines 62-66).

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Yoshikawa teaches that a colorless compound may be co-adsorbed together with the dyes to weaken an interaction between the dyes, such as association (see col. 13, lines 42-49). Thus, even if there was association of dyes, a skilled artisan would know how to weaken this interaction so that there is essentially no association. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a dye that has no acidic groups as the sensitizing dye in Uchida et al's dye-sensitized solar cell because such dyes are conventional in the art, as shown by Wariishi et al and Yoshikawa. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used mixtures of dyes in Uchida et al's dye-sensitized solar cell because, with mixtures of dyes, a large photoelectric conversion region and a high photoelectric conversion efficiency can be obtained, as shown by Wariishi et al and Yoshikawa. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have prevented association of the dyes in Uchida et al's dye-sensitized solar cell because it is known in the art that a colorless compound may be co-adsorbed together with the dyes to weaken an interaction between the dyes, such as association, as taught by Yoshikawa.

Response to Arguments

Applicant's arguments filed July 10, 2006 have been fully considered but they are not persuasive.

The objections to the specification and the drawings have been overcome. The rejections under 35 U.S.C. 112 have been overcome.

In response to the argument that there is no motivation to utilize a dye having no acidic substituents in Uchida, it is argued that one would be motivated to select a dye having no acidic substituent since such a dye will produce a solar cell having a large photoelectric conversion region and a high photoelectric conversion efficiency. (See Wariishi et al. and Yoshikawa discussed above)

In response to the argument that there is no motivation to combine teachings from art relating to materials other than nanotubes with the teachings from art relating to nanotubes, it is argued that utilizing teachings from art related to other materials for combining with nanotubes is that it allows producing solar cells having a large photoelectric conversion and a high photoelectric conversion. (See Wariishi et al. and Yoshikawa discussed above)

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

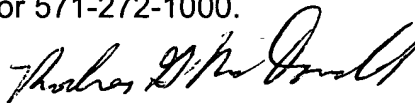
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Rodney G. McDonald
Primary Examiner
Art Unit 1753

RM
October 25, 2006